UCRL-JC-123136 Abs
A novel method for diagnosing the growth of subresolution-scale perturbations*

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We propose a novel method for diagnosing the growth of subresolution-scale perturbations at an embedded interface. Previously, face-on radiography of a target with perturbations placed at the interface between a 35 μm thick CH(Br) ablator and a 15 μm thick Ti ablator under the influence of an x-ray drive has been used at the Nova laser facility to diagnose the growth of perturbations with wavelengths as short as 10 μm. [1] Preparation of well characterized interfaces with shorter wavelength perturbations is well within our target fabrication abilities, but such wavelengths are below the resolution limit of current diagnostic configurations, typically ~ 8 μm with a gated x-ray imager as the diagnostic. [2]. In order to expand this study to shorter wavelengths, we propose imposing a pair of short wavelengths ($\lambda = 4$ and 5 μm, $\eta_o = .3$ μm) superposed in phase at the interface. At second order in the nonlinear regime, these modes will begin to *couple* to produce the $k_1 \pm k_2$ beat modes giving $\lambda_+ = 2.22$ μm, below the experimental resolution, and $\lambda_- = 20$ μm, readily diagnosed by face-on radiography. The appearance of this (relatively) long wavelength mode can then be used to infer the growth rates of the two initial modes. *This work was performed under the auspices of the U. S. Department of Energy by the Lawrence Livermore National Laboratory under Contract No. W-7405-ENG-48.

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[1] K. S. Budil *et al.*, "Classical Rayleigh-Taylor Experiments at Nova", to be submitted to *Phys. Rev. Lett.*.
[2] K. S. Budil *et al.*, "The Flexible X-ray Imager", accepted for publication in *Rev. Sci. Instrum.*.